AMENDMENTS TO THE SPECIFICATION

Please disregard the computer-translated title of the published PCT application and use the following title: MULTIMODE DIELECTRIC RESONATOR DEVICE, DIELECTRIC FILTER, COMPOSITE DIELECTRIC FILTER AND COMMUNICATION APPARATUS

Paragraph from page 1, line 24 to page 2, line 5:

However, in a known multimode dielectric resonator device, there has been a problem in that coupling is also produced between ~~the~~ one TM mode and another~~the~~ TM mode at the same time even if the shape of the dielectric core is determined only by paying attention to the portion on which two modes of electric fields to be coupled are concentrated in order to perform the coupling between the TE mode and the TE mode.

Paragraph from page 2, line 17 to page 3, line 2:

However, the groove and the hole described above cause perturbation to arise between an TM01δ-x mode in which an electric field is directed in an x direction and an TM01δ-y mode in which an electric field is directed in a y direction, and thus these two TM modes are coupled with each other. That is to say, in a multimode dielectric resonator using both the TM mode and the TE mode, when the coupling between the TE mode and the TE mode is performed, the coupling between the TM modes ~~and the TM mode~~ is also caused to arise, and thus it is difficult to

independently determine the amount of coupling between the TE mode and the TE mode.

Paragraph from page 8, line 2 to page 10, line 1:

Figs. 1 A to 1D are ~~is a~~ diagrams illustrating directions of electric flux and magnetic flux of four resonant modes in the multimode dielectric resonator device according to a first embodiment.

Figs. 2A and 2B are ~~is a~~ diagrams illustrating directions of the passing electric flux of each mode of the same dielectric resonator device.

Figs. 3A and 3b are ~~is a~~ diagrams illustrating directions of the passing electric flux of each mode in a state in which a dielectric core 1 is contacted with the inner surface of a cavity 2.

Fig. 4 is a diagram illustrating examples of the distribution of electric flux densities in the four resonant modes.

Fig. 5 is a diagram illustrating a coupling sequence of the four resonant modes.

Figs. 6A to 6D are ~~is a~~ diagrams illustrating a cross-sectional shape of each layer of the dielectric core in the cavity.

Figs. 7A to 7D are ~~is a~~ diagrams illustrating the effect of a protrusion of the TE coupling on an TE coupling mode and an TM coupling mode.

Figs. 8A and 18B are ~~is a~~ diagrams illustrating a relationship between the amount of protrusion of a protrusion portion P disposed in the dielectric core 1 and the resonant frequency and the coupling factor of each mode.

Figs. 9A and 9B are ~~is a~~ diagrams illustrating relationships between the amount of protrusion of a protrusion portion P and the amount of subsidence of a subsidence portion S disposed in the dielectric core 1.

Figs. 10A and 10B are ~~is a~~ diagrams illustrating the configuration of a dielectric filter.

Figs. 11A and 11B are ~~is a~~ diagrams illustrating the configuration of a dielectric filter according to a second embodiment.

Figs. 12 A and 11B are ~~is a~~ diagrams illustrating the configuration of a dielectric filter according to a third embodiment.

Figs. 13 A and 11B are ~~is a~~ diagrams illustrating the configuration of another dielectric filter according to the third embodiment.

Figs. 14 A and 11B are ~~is a~~ diagrams illustrating the configuration of a dielectric filter according to a fourth embodiment.

Figs. 15 A and 11B are ~~is a~~ diagrams illustrating the configuration of another dielectric filter according to the fourth embodiment.

Figs. 16 A and 11B are ~~is a~~ diagrams illustrating the configuration of a dielectric filter according to a fifth embodiment.

Figs. 17 A and 11B are ~~is a~~ diagrams illustrating the configuration of another dielectric filter according to the fifth embodiment.

Figs. 18 A and 11B are ~~is a~~ diagrams illustrating the configuration of a dielectric filter according to a sixth embodiment.

Figs. 19 A and 11B are ~~is a~~ diagrams illustrating the configuration of a dielectric filter according to a seventh embodiment.

Figs. 20 A and 11B are ~~is a~~ diagrams illustrating the configuration of a dielectric filter according to an eighth embodiment.

Fig. 21 is a diagram illustrating the configuration of a composite dielectric filter according to a ninth embodiment.

Fig. 22 is a block diagram illustrating the configuration of a communication apparatus according to a tenth embodiment.

Paragraph from page 10, line 7 to page 10, line 21:

The material of the dielectric core disposed in the devices shown in each embodiment including this first embodiment is selected in accordance with the frequency band used for the device. For example, a selection is made from groups including zirconium titanate-stannum titanate series compounds, rare-earth barium titanate series compounds, barium titanate series compounds, zinc barium tantalate series compounds, magnesium barium tantalate series compounds, rare earth aluminate -calcium titanate series compounds, magnesium titanate-calcium titanate series compounds. The relative dielectric constant at this time has an arbitrary value between 20 to 130. A zirconium titanate-stannum titanate compound having a relative dielectric constant of 38 is used in this first embodiment and the other embodiments shown subsequently.

Paragraph from page 10, line 22 to page 11, line 6:

Figs. 1A to 1D are ~~is a~~ perspective views showing a dielectric core disposed in a cavity and the shapes of four resonant modes to be used. A solid-line arrow in the figure indicates a line of electric force and a broken-line arrow indicates a line of magnetic force. Fig. a(A) is the TM01δ_x mode, which is the first TM01δ mode, Fig. 1(B) the TE01δ_y mode, which is the first TE01δ mode, Fig. 1(C) the TE01δ_x mode, which is the second TE01δ mode, and Fig. 1(D) the TM01δ_y mode, which is the second TM01δ mode, each

of which shows the electromagnetic filed distributions using lines of electric force and lines of magnetic force.

Paragraph from page 11, line 7 to page 11, line 12:

~~Also,~~ Figs. 2A and 2B shows electric flux density distribution of the four modes, including the cavity. ~~Here~~In these figures and also in figures 3 and 10-19, (A) is a view seen from z-axis direction~~.~~ and (B) is a view seen from y-axis direction. Also, the solid-line arrow indicates a line of electric force. In this manner, a dielectric core 1 is disposed inside cavity 2 having a substantially cubic shape.

Paragraph from page 13, line 23 to page 14, line 22:

Next, a structure for coupling the TE01δ_y mode and the TE01δ_x mode without producing the coupling between the TM01δ_x mode and the TM01δ_y mode is shown in Figs. 6. Here, Fig 6(D) is a side view seen in the y-axis direction, 6(A) is a sectional view seen on A-A part, 6(B) is a sectional view taken on B-B part, and 6(C) is a sectional view seen on C-C part. The dielectric core 1 basically has a three-layer structure. (A), (B), and (C) are sectional views taken on an upper layer La, a middle layer Lb, and a lower layer Lc, respectively. In the upper layer La part, as shown in 6(A), protrusions Pe1 of the dielectric core protruding in the direction of x + y (in the direction having a direction angle of 45° assuming that the x direction is 0 degree) and in the direction of -(x + y) (in the direction having a direction angle of -135° assuming that the x direction is 0 degree) are formed at the intersection between the x-direction part 1x and y-direction part 1y of the dielectric core 1. Also, in the lower layer Lc part, as shown in ~~(C~~6(D), protrusions Pe2 are formed in the same direction. In the middle layer Lb part, as shown in 6(a) and 6(C) ~~(B)~~, protrusions Pc protruding in the direction of y - x (in the direction

having a direction angle of 135° assuming that the x direction is 0 degree) and in the direction of x - y (in the direction having a direction angle of -45° assuming that the x direction is 0 degree) are formed, respectively.

Paragraph from page 14, line 23 to page 15, line 12:

Figs. 7(A) ~~and 7(B)~~ to 7(D) show electric flux distribution of two coupling modes (TE coupling modes) by the TE01δ_x mode and the TE01δ_y mode when the dielectric core 1 having the structure shown in Fig. 6(A) is used. Figs. 7(A) and 7(B) show an even-mode electric flux distribution and an odd-mode electric flux distribution, respectively. In this case, the protrusions Pe1 of the dielectric core operate to increase the effective dielectric constant of the part through which an even-mode electric flux passes. This is also applied to the operation provided by the protrusions Pe2 of the lower layer shown in Fig. 6. As a result, the resonant frequency of the even mode decreases, and thus a difference with the resonant frequency of the odd mode occurs to couple the TE01δ_x mode and the TE01δ_y mode.

On the other hand, Figs. ~~7(C)~~ 7(B) and 7(D) shows electric flux distribution of two coupling modes (TM coupling modes) by the TM01δ_x mode and the TM01δ_y mode. ~~(C) and (D)~~Figs. 7(B) and 7(D) show an even-mode electric flux distribution and an odd-mode electric flux distribution, respectively. Here, the protrusions Pe1 operate to increase the effective dielectric constant of the part through which an odd-mode electric flux passes. This is also applied to the operation provided by the protrusions Pe2 disposed on the lower layer. Accordingly, the resonant frequency of the odd mode decreases, and thus a difference with the resonant frequency of the even mode occurs to couple the TM01δ_x mode and the TM01δ_y mode.

Paragraph from page 16, line 1 to page 16, line 22:

However, protrusions Pc are disposed on the middle part of the dielectric core 1 shown in Fig. 6(A). These protrusions Pc protrude in ~~the~~ 90°-different directions ~~which is~~ with an z-axis as center with respect to the protruding directions of the upper layer protrusions Pe1 and the lower layer protrusions Pe2. These protrusions Pc operate in the direction to decrease the resonant frequency of the even mode of the TM coupling mode contrary to the case shown in Figs. 7(C) and 7(D). As a result, it is possible to make the resonant frequencies of the even mode and the odd mode of the TM coupling mode equal by determining the amount of the protrusions Pe1, Pe2, and Pc. That is to say, it is possible to restrain the coupling of the TM01δ_x mode and the TM01δ_y mode. Although the protrusions Pc of the dielectric core 1 also give some influence on the TE coupling mode, however, they give smaller influence than that on the TM coupling mode, because the electric flux density of the TE coupling mode is relatively higher in the upper part and the lower part than in the middle part of the dielectric core. Accordingly, the protrusions Pc have almost no influence on the amount of coupling between the TE01δ_x mode and the TE01δ_y mode.

Paragraph from page 25, line 18 to page 26, line 14:

Fig. 20 is a diagram illustrating the configuration of a dielectric filter according to an eighth embodiment. The dielectric core 1 used here is the same as the dielectric core 1 shown in Fig. 12. However, the dielectric core 1 is disposed in a state of being rotated 45° with the z-axis as center inside of the cavity 2. Also, a probe 4a ~~are~~is disposed near the end of the x-direction part 1x of the dielectric core and another probe 4a~~b~~ is disposed near the end of the y-direction part 1y of the dielectric core in accordance with the above. Note that although the portions of the dielectric core denoted by 1x and 1y are not in the x-direction and y-direction, respectively, the same reference numerals are used in order to correspond to the reference numerals shown in Fig. 12. Here, the TM mode in which

electric flux mainly passes through the 1x portion of the dielectric core 1 can be called the TM01δ_(x + y) mode, the TM mode in which electric flux mainly passes through the 1y portion of the dielectric core 1 can be called the TM01δ_(x - y) mode. Further, the TE mode in which electric field rotates in the 1x portion can be called the TE01δ_(x + y) mode, and the TE mode in which electric field rotates in the 1y portion can be called the TE01δ_(x - y) mode.